ORIGINAL ARTICLES

Growth and change in the prescribing of anti-depressants in New Zealand: 1993-1997

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Abstract

Aims. To examine changes in the prescribing of anti-depressants in New Zealand from 1993-1997, in terms of expenditure, the number of dispensings and days of therapy supplied.

Method. Data on subsidised dispensings of anti-depressant drugs during 1993 to 1997 were obtained from PHARMAC and analysed using SAS.

Results. The overall size of the anti-depressant market increased considerably over the study period. Government expenditure rose 2.25 times, and 1.65 times as many days of anti-depressant medication were supplied in 1997 as in 1993. Most of this was due to the growth in prescribing of newer anti-depressants, but the use of older drugs remained constant.

Conclusions. In common with other countries, the use of newer agents is contributing to increased overall use of anti-depressant medication and government expenditure in New Zealand. Use of older drugs has not diminished substantially.

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The last decade saw considerable changes in treating depression. Until the late 1980s, treatment often included tricyclic anti-depressants and psychotherapy.[1] Since 1988, three major new anti-depressants have been introduced to New Zealand. These two selective serotonin reuptake inhibitors (SSRIs), fluoxetine (1988) and paroxetine (1992), and one new monoamine oxidase inhibitor (MAOI) moclobemide (1990) changed depression treatment options substantially. The newer drugs are more expensive than older medications and were heavily marketed, but their superiority over older drugs is controversial. Recent reviews have concluded that there are no significant differences in clinical- or cost- efficacy between SSRIs and tricyclic anti-depressants.[2,3] Controversy also remains about the acceptability of the new anti-depressants' side effect profile.

During the 1990s, there has been increased recognition of the public health and economic impact of depression.[4] This is attributable, in part, to the interest of manufacturers of newer treatments in supporting economic evaluations and cost of illness studies.[5] The presence of new treatment options, and increased public awareness of depression have expanded the market for anti-depressants.

Overseas research has found substantial growth in anti-depressant prescribing and expenditure. In Ontario, anti-depressant expenditure for elderly residents increased 120% between 1990 and 1995, while the population receiving anti-depressants grew only 35%.[3] Donoghue et al found that anti-depressant prescriptions increased 30% between 1993 and 1995 in a group of general practices in the United Kingdom.[6] There is some evidence that growth in anti-depressant prescribing is composed of increased prescribing of newer drugs, while prescribing of older medications remains almost constant. At a population level, new drugs are not necessarily replacing older drugs, but are being used in addition.[7,8]

This paper examined changes in anti-depressant prescribing in New Zealand from 1993 to 1997. Firstly, we describe the changing level of expenditure, dispensings and number of days dispensed of all anti-depressant medication. We then examine the changing composition of the anti-depressant market, between new and old drugs. We addressed these questions using Health Benefits Limited (HBL) data on claims for prescriptions dispensed by New Zealand pharmacies. Overseas studies have often used sub-national and unrepresentative databases such as general practice networks, Health Maintenance Organisation enrollees, municipalities, or samples of ambulatory care encounters.[6,9-13] An advantage of HBL data is its nearly complete population coverage for New Zealand. Data for the North Health region may be incomplete since, during the mid-1990s, they maintained their own database of dispensings which was added retrospectively to the HBL data.

Methods

PHARMAC supplied HBL data from their data warehouse on subsidised dispensings of anti-depressants (3.9 million dispensings). Dispensings by community or hospital pharmacies were included, but not in-patient medication use. Dispensings do not represent prescriptions, since one prescription can result in several dispensings. The records cannot be linked to particular patients, so it was not possible to determine whether any two prescriptions were for the same person or different people. Therefore, we could not calculate how many people received anti-depressants, or how much medication each received.

The data included all prescriptions which received some government subsidy. Whether a pharmaceutical is subsidised depends on the drug price, size of the prescription, and entitlement status of the patient. Because a small prescription of cheap medicine to a person without a community service card may not have a subsidy, the database may exclude some dispensings of small quantities of cheaper anti-depressants. As the database was generated from payment of claims for dispensing, most fields had little missing data. In particular, fields required for calculating pharmacy reimbursements were almost always completed. The dataset were analysed using SAS.[14]

All expenditure figures reported are government expenditure adjusted to 1997 prices using the Consumer Price Index (CPI).[15] Should anti-depressant prices change at a different rate from general prices, CPI adjustment would give an inaccurate picture of the real volume of anti-depressants purchased.[16] Adjustment by the CPI indicates the value of non-anti-depressant commodities relinquished to purchase anti-depressants.[17] Between 1993 and 1997, cumulative growth in the CPI was 9.6%, while PHARMAC's pharmaceutical price index declined 14%. Thus, readers should not interrupt expenditure figures as a 'metric' of the real volume of anti-depressant dispensing.

Results

The anti-depressant market grew significantly from 1993 to 1997. Total real cost to the government of anti-depressants doubled from $26.4 million in 1993 to $60.0 million in 1997 (Table 1). Length of supply rose from a total of 23.3 million days in 1993 to 38.5 million days in 1997 (Table 2). This is equivalent to an increase from

63 795 people taking anti-depressants continuously for a year in 1993 to 105 471 in 1997.

Table 1. Government expenditure on anti-depressants: 1993-1997.

	Government expenditure ($000)				
Type of Antidepressant	**1993**	**1994**	**1995**	**1996**	**1997**
Tricyclic	8737	8178	8159	7908	8313
SSRI	11 666	20 566	26 893	32 423	44 661
Reversible MAOI	4825	4661	5022	5647	6322
Tetracyclic	671	515	458	373	339
MAOI	493	446	447	411	407
Total	**26 381**	**34 374**	**40 983**	**46 761**	**60 042**

SSRI = selective serotonin reuptake inhibitors. MAOI = monoamine oxidase inhibitors.

Table 2. Days supplied of anti-depressants: 1993-1997.

	Days supplied (000)				
Type of Antidepressant	**1993**	**1994**	**1995**	**1996**	**1997**
Tricyclic	18 407	18 574	19 227	18 457	20 875
SSRI	2970	6146	8306	10 067	15 465
Reversible MAOI	1313	1291	1349	1504	1763
Tetracyclic	346	283	249	198	194
MAOI	249	225	219	189	200
Total	**23 285**	**26 519**	**29 350**	**30 415**	**38 497**

SSRI = selective serotonin reuptake inhibitors. MAOI = monoamine oxidase inhibitors.

Between 1993 and 1995, the increase in expenditure was due both to an increase in the number of dispensings and an increase in the average real cost per dispensing. The number of dispensings rose steadily from 473 202 in 1993 to 598 246 in 1995 (Table 3). An average dispensing in 1993 cost the government $51.29, rising to $68.51 in 1995. Introduction of monthly dispensing in May 1996 artificially increased the number of dispensings and decreased average cost per dispensing. Because of this, in 1996, the number of dispensings jumped to 932 544, and rose to 1 350 319 in 1997.

Table 3. Dispensings of anti-depressants: 1993-1997.

	Dispensings of anti-depressants				
Type of Antidepressant	**1993**	**1994**	**1995**	**1996**	**1997**
Tricyclic	363 239	360 399	381 022	551 488	732 656
SSRI	67 150	133 156	177 311	321 336	540 494
Reversible MAOI	31 753	29 428	31 352	48 854	63 942
Tetracyclic	6346	5095	4308	5162	5976
MAOI	4714	3918	4253	5702	7240
Total	**473 202**	**531 996**	**598 246**	**932 544**	**1 350 319**

SSRI = selective serotonin reuptake inhibitors. MAOI = monoamine oxidase inhibitors.

Despite SSRIs' growing popularity, tricyclics continued to account for a large proportion of anti-depressant dispensings. In 1993, three tricyclics – amitriptyline, doxepin and dothiepin – were the most dispensed anti-depressants, followed by fluoxetine (an SSRI). Since 1994, fluoxetine has been the most dispensed anti-depressant, with the three tricyclics still being frequently dispensed. Since 1996, another SSRI, paroxetine, has been the third most dispensed anti-depressant. Tetracyclics and older MAOIs formed a small and declining proportion of dispensings (2.3% in 1993; 1% in 1997).

Prescribing of newer and older anti-depressants. Choices for anti-depressant drug therapy changed substantially with the introduction of fluoxetine in 1988, moclobemide in 1990, and paroxetine in 1992. A third SSRI, sertraline, has become available but is subsidised in exceptional circumstances only. Soon after their introduction to the market in 1993, the new anti-depressants comprised 20.9% of the dispensings, yet they already claimed 62.5% of government expenditure on anti-depressants.

New drugs comprised an increasing percentage of dispensings (from 20.9% in 1993 to 44.8% in 1997), expenditure (from 62.5% in 1993 to 84.9% in 1997) and total days supplied (from 18.4% in 1993 to 44.8% in 1997). New anti-depressants' importance in the market place was most evident when measured by days supplied. By 1997, new anti-depressants accounted for 2.43 times as much of the total days of anti-depressant therapy supplied, 2.14 times as many dispensings, and 1.36 times as much of government expenditure as they did in 1993. Thus, the relative price of a day of new anti-depressant drug therapy declined between 1993 and 1997. Some of this relative price reduction is attributable to PHARMAC's contracting arrangement for fluoxetine since 1996. PHARMAC placed a cap on total subsidy payable in a single year. When expenditure exceeded the cap, the manufacturer (Eli Lilley) rebates the difference to PHARMAC.[18] The contract allowed general practitioners (GPs) to prescribe fluoxetine without a specialist's recommendation from 1 September 1996. Even prior to this change, non-specialist practitioners wrote the majority of fluoxetine prescriptions dispensed. In 1993, 79% of fluoxetine dispensings were made by non-specialists, growing to 87% of dispensings in 1997.

Discussion

As also occurred internationally, New Zealand's consumption of anti-depressants grew substantially during the mid-1990s.[7,8] At a population level, the dispensing of older anti-depressants remained roughly constant, while consumption of newer anti-depressants has grown substantially. Government expenditure on new anti-depressants grew 3.1 times between 1993 and 1997 but growth was most dramatic for SSRI expenditure (3.8 fold). Hence, the growth in total government expenditure on anti-depressants can be attributed both to volume growth and to changes in composition; more anti-depressants are being dispensed and a growing proportion of anti-depressant consumption is of the more expensive newer drugs.

The growing rate of prescribing of anti-depressants in New Zealand could be due to several factors. The prevalence of depression could be increasing, patients could be presenting to their GPs with depression more often, or doctors could be identifying more patients as having a depressive disorder. Doctors could also be moving away from non-drug treatments for depression and prescribing more anti-depressants than in the past, or they may be prescribing anti-depressants for patients they had previously prescribed other drugs such as anxiolytics. Patients may be responding to increased marketing and discussion of anti-depressant medication and asking their doctors for these either directly or indirectly. Anti-depressant drugs are also being indicated for the treatment of conditions such as eating disorders. These explanations are not, of course, mutually exclusive. It is possible that some of these factors might have led to an increase in anti-depressant prescribing, even without the introduction of newer drugs since 1988. The lack of patient identifiers and diagnostic information in our data means that other sources are required to answer important questions about the efficacy and effectiveness (including cost-effectiveness) of depression treatment. Dispensing data alone

cannot identify whether the growth in anti-depressant consumption was beneficial overall, or for individuals.

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1. Kaplan HI, Sadock BJ, editors. Synopsis of psychiatry. Baltimore: Williams and Wilkins; 1998.
2. Canadian Coordinating Office for Health Technology Assessment. Selective serotonin reuptake inhibitors for major depression. Part II. The cost effectiveness of SSRIs in treatment of depression. Ottawa: Canadian Coordinating Office for Health Technology Assessment; 1997.
3. Canadian Coordinating Office for Health Technology Assessment. Selective serotonin reuptake inhibitors for major depression. Part I. Evaluation of the clinical literature. Ottawa: Canadian Coordinating Office for Health Technology Assessment; 1997.
4. National Health Committee. Guidelines for the treatment and management of depression by primary healthcare professionals. Wellington: National Health Committee; 1996.
5. Stewart A. Choosing an anti-depressant: effectiveness based pharmacoeconomics. J Affect Dis 1998; 48: 125-33.
6. Donoghue J, Tylee A, Wildgust H. Cross sectional database analysis of anti-depressant prescribing in general practice in the United Kingdom, 1993-5. BMJ 1996; 313: 861-2.
7. Freemantle N, Mason JM, Watt I. Evidence into practice: prescribing selective serotonin reuptake inhibitors. Int J Technol Assess Health Care 1998; 14: 387-91.
8. Nordic Statistics on Medicines 1993-1995. Uppsala: Nordic Council on Medicines; 1996.
9. Pathiyal A, Hylan T, Jones J et al. Prescribing of selective serotonin reuptake inhibitors, anxiolytics, and sedative-hypnotics by general practitioners in The Netherlands: a multivariate analysis. Clin Ther 1997; 19: 798-810.
10. Katelznick DJ, Kobak KA, Jefferson JW et al. Prescribing patterns of anti-depressant medications for depression in a HMO. Formularly 1996; 31: 374-88.
11. Rosholm J-U, Hallas J, Gram LF. Outpatient utilisation of anti-depressants: a prescription database analysis. J Affect Dis 1993; 27: 21-8.
12. Olfson M, Marcus SC, Pincus HA et al. Anti-depressant prescribing practices of outpatient psychiatrists. Arch Gen Psychiatry 1998; 55: 310-6.
13. Pincus HA, Tanielian TL, Marcus SC et al. Prescribing trends in psychotropic medications: primary care, psychiatry, and other medical specialties. JAMA 1998; 279: 526-31.
14. SAS Institute. SAS Procedures Guide, Version 6. Third ed. Cary: SAS Institute; 1990.
15. Reserve Bank of New Zealand. Monetary policy statement. Wellington: 1998.
16. Brown MC. Developing an implicit price deflator for New Zealand's health sector. New Zealand Economic Papers 1997; 31: 15-34.
17. Ellis J, Devlin A, Galapitage C. Health expenditure trends in New Zealand 1980-1997. Wellington: Ministry of Health; 1998.
18. Rotherham F. Prozac windfall buoys PHARMAC. The Independent 1998; 16: September 7.

Regional variation in anti-depressant dispensings in New Zealand: 1993-1997

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Abstract

Aims. To examine regional differences in the prescribing of anti-depressants in New Zealand from 1993 to 1997, and to examine the composition and dynamics of these differences.

Methods. Data on every subsidised dispensing of anti-depressant drugs 1993 to 1997 were obtained from PHARMAC and analysed using SAS. Each dispensing was allocated to a regional council area on the basis of the location of the dispensing pharmacy.

Results. Prescribing of anti-depressants increased with time in all regions. However, there was substantial regional variation in prescribing rates per-capita, the highest being 2.28 to 2.49 times the lowest in every year. Regions also varied substantially in the mix of newer and older drugs used, although newer drugs became increasingly important in every region.

Conclusions. Regional differences in anti-depressant prescribing are large. Further research with different data sources is required to explore the reasons for this variation.

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In a companion paper, we considered changes in anti-depressant prescribing in New Zealand between 1993 and 1997, examining days of anti-depressant therapy supplied, government expenditure and dispensings.[1] Growth in anti-depressant prescribing came from sustained growth in prescribing newer drugs, with constant use of older drugs. The previous paper emphasised changes over time. The present paper takes a cross-sectional approach, analysing regional differences in prescribing.

Internationally, there is evidence of variation in the rate of treatment between countries, between regions within countries, and between practitioners within regions.[2-4] Studies of prescribing variation are rare. Davis et al analysed CoMedCa data, and found practitioner identity significantly predicted prescribing behaviour.[5] Norris et al examined regional variation of prescribing of new antidepressants (fluoxetine, paroxetine and moclobemide) in New Zealand between October 1993 and March 1994.[6] They found high regional variation in dispensing of fluoxetine. Fluoxetine capsules prescribed per-capita in Canterbury were more than double the level in Waikato, which had the next highest level. Using a logarithmic decomposition, the nature of this variation was explored. Dispensings per-capita explained 89% of variance in dispensed capsules per-capita. Variation in prescriptions per person was thus more important than variation in prescription size. Another decomposition of the variance showed that per-capita doctor supply explained 12% of the variance in capsules per population.

This paper examines regional variation in prescribing of all anti-depressants from 1993 to 1997. We consider whether there was any inter-regional variation over this period, and explore the composition of variation found.

Methods

We obtained Health Benefits Limited (HBL) data on anti-depressant dispensings between 1993 and 1997, as discussed in our previous paper.[1]

Dispensings were mapped to geographical areas using the location of the dispensing pharmacy. Previous work by Norris et al[6] used doctors' locations. Pharmacy location was used as a proxy for the doctor's location, because pharmacy location data were more complete (between 1993 and 1997, 30.7% and 32.6% of prescribers were unable to be mapped to a region).

Norris et al used Area Health Board regions, which have no current administrative significance.[6] We used regional councils as our geographical areas, because there were a moderate number (sixteen) of them, and they were large enough to reduce problems from prescriptions being dispensed and prescribed in different areas. Regional council boundaries were stable, facilitating comparison between years. Population counts for regional councils were obtained from Supermap 3.0 for the census years 1991 and 1996.[7] We assumed there was linear inter-censal growth in population. Population estimates for 1997 were obtained from Statistics New Zealand. For each year we calculated, using SAS, for each regional council area, the number of anti-depressant dispensings per 1000 people, cost to the government per person, and days of anti-depressant drug therapy supplied per 1000 people.[8]

Results

Nationwide, the level of anti-depressant prescribing, and the proportion of prescribing for newer drugs, rose substantially from 1993-1997,[1] a trend largely repeated within regions. Per-capita expenditure rose each year in every region (except in Gisborne where it fell 1994-5), the number of dispensings per 1000 people rose every year in every region, and the number of days supplied per 1000 people rose every year in every region (except for falls in Canterbury, Marlborough, Otago and Southland 1995-6 and Gisborne 1994-6). Despite similar growth rates, there was variation in anti-depressant dispensing levels after adjusting for population size.

Every year, Canterbury had the highest rate of anti-depressant dispensings per-capita, around 2.3 times higher than the rate in the lowest area: Northland (1993-5) and Gisborne (1996 and 7; Table 1). A similar pattern held for government expenditure and days supplied. Canterbury was always the highest region, with a rate of government expenditure between four and five times the lowest rate (Northland, Hawkes Bay or Gisborne; Table 2 and 3). Canterbury's per-capita rate of days supplied was over twice as high as the lowest rate (Northland or Gisborne; Table 4).

A measure of inter-regional variability is the population weighted coefficient of variation (CVW), which standardises variance by dividing it by the mean. Like the ratio of the highest-to-lowest levels, the CVW tended to be consistent across time for all three measures. The CVW was higher for per-capita government expenditure than for items or days supplied per 1000 people – a relationship that was stable over the period studied. Inter-regional variation was greater for expenditure than for days supplied or dispensings. In part, the CVW was higher for expenditure because regions with greater per-capita dispensings tended to have a higher ratio of newer to total drugs used.

Regions varied in the type of anti-depressants prescribed. Norris et al found that in 1993/94, Canterbury had the highest per capita rate of fluoxetine prescribing, and Southland the lowest.[6] We found that in 1993, the ratio of days supplied for older to newer drugs varied between 15.5 (Southland) and 3.6 (Canterbury). That is, for every day of newer anti-depressant medication supplied in Southland, 16 days were supplied of older anti-depressant medication. In the next year, the ratio of old-to-new days in Southland dropped to 7.6. This might partly reflect the smaller population of both prescribers and consumers in Southland. Canterbury always had the lowest ratio of old-to-new days supplied.

Over the period to 1997, there was substantial convergence between the regions in the composition (older/newer) of anti-depressant dispensings. In 1997, the ratio of older: newer days supplied varied between 2.3 (Gisborne) and 0.9 (Canterbury). Thus, by 1997, more days of newer than older anti-depressant medication were supplied in Canterbury. The same trend was evident for dispensings and government expenditure. Newer antidepressants became increasingly important in every region. Regions have become more alike than in 1993, shortly after the introduction of newer anti-depressants. Nevertheless, prescribing rates of both older and newer medications continued to vary between regions (Table 4).

The changing nature of regional variation was explored by decomposing the variance in days supplied and government expenditure. Causal analysis of regional variation was not possible with this dataset. Variation in expenditure per-capita could be due to a high number of dispensings or dispensings for expensive anti-depressants. Expenditure per-capita can be expressed as: – expenditure/population=dispensings/population x expenditure/dispensings.

Because $Var(ln(x.y)) = Var\ (ln(x)) + 2Cov(ln(x), ln(y))$, proportions of variance in the natural logarithm of expenditure per-capita can be attributed to the variances of the two components, and their covariance. This identity was calculated separately for all years from 1993-1997. Initially, the major contributor to variation in per-capita expenditure was variance in the average cost per dispensing. In 1993, this composed more than half the variance in per-capita expenditure, consistent with evidence above of regional convergence in the proportions of old and new medications dispensed. Covariance between the two terms has also grown, indicating that where there is higher prescribing per-capita, prescriptions are costlier on average.

Similarly, the days supplied per-capita could be due to the number of dispensings or to the length of dispensings. Days supplied per-capita can be expressed as: – days supplied/population=days supplied/dispensings x dispensings/population.

Per-capita dispensings over-explain variation in per-capita days supplied. In every year between 1993 and 1997, variation in per-capita dispensings accounted for more than 100% of the variance in per-capita days supplied, though this dropped over time (Table 6). Variation in average length of dispensing accounted for a small and diminishing percentage of variance in days supplied. The two terms 'over-explain' the variation found because per-capita dispensings and average length of dispensings are inversely related. On average, in regions where more dispensings were made, dispensings were shorter. This relationship became less significant over time and is partly attributable to monthly dispensing, as the maximum pharmacies can dispense is a month's supply.

Discussion

The national trend of a substantial growth in anti-depressant prescribing between 1993 and 1997[1] was evident in all regions. Despite similarity in the pattern of growth, there was regional variation in prescribing levels. Using any of our three measures (dispensings, expenditure or days supplied), there was high inter-regional variation.

Norris et al found high rates of prescribing of new anti-depressants in Canterbury, but could not interpret this without information about overall prescribing rates.[6] We found on three different measures that anti-depressant prescribing rates in Canterbury were consistently high. Additionally, regions with higher dispensing rates per-capita tended to have higher ratios of new:total drugs dispensed. Canterbury had the highest level of new drugs prescribed as a proportion of the total. By 1997, more days of new drugs were prescribed than days of old drugs, putting the previous results in context. Norris et al thought the high use of new anti-depressants in Canterbury might be because Canterbury doctors used new drugs, when doctors elsewhere used older drugs. This paper shows that high prescribing of new drugs coincides with high use of anti-depressants in general, combined with greater use of newer therapies. This narrows down the range of explanations. It does not provide evidence on the prevalence or severity of depression in the regions. This may be higher in some regions, or it may be that prescribers in some regions are more sensitive to the possible existence of depression in their patients, or that they are more likely to use medication to treat depression. Because dispensing data also provide no information on variation in treatment outcomes between regions, it is not possible to assess where the level of anti-depressant prescribing is most appropriate to the prevalence and severity of depression.

There was variation among regions in use of new drugs. In 1993, there was substantial divergence in ratios of old:new anti-

Table 1. Regional variation in dispensings per 1000 people.

Year	1993	1994	1995	1996	1997
New Zealand rate	138.1	153.2	170.2	262.2	374.5
Highest rate	221.8	249.6	269.8	387.7	545.6
(regional council)	(Canterbury)	(Canterbury)	(Canterbury)	(Canterbury)	(Canterbury)
Lowest rate	95.9	100.2	114.3	169.5	236.8
(regional council)	(Northland)	(Northland)	(Northland)	(Gisborne)	(Gisborne)
Extremal quotient	2.31	2.49	2.36	2.28	2.30
Population weighted coefficient of variation	127.35	130.23	124.15	104.68	107.85

Table 2. Regional variation in government expenditure per person.

Year	1993	1994	1995	1996	1997
New Zealand rate	$7.75	$9.94	$11.71	$13.19	$17.06
Highest rate	$16.38	$20.64	$23.48	$25.35	$29.50
(regional council)	(Canterbury)	(Canterbury)	(Canterbury)	(Canterbury)	(Canterbury)
Lowest rate	$3.70	$4.41	$5.78	$6.00	$7.09
(regional council)	(Northland)	(Northland)	(Hawkes Bay)	(Gisborne)	(Gisborne)
Extremal quotient	4.42	4.67	4.06	4.22	4.15
Population weighted coefficient of variation	224.43	217.90	203.25	184.63	161.06

Table 3. Regional variation in days supplied per 1000 people.

Year	1993	1994	1995	1996	1997
New Zealand rate	6790.4	7635.0	8350.6	8548.3	10 679.8
Highest rate	10 164.1	11 834.6	12 807.7	12 524.3	15 525.3
(regional council)	(Canterbury)	(Canterbury)	(Canterbury)	(Canterbury)	(Canterbury)
Lowest rate	4712.4	5142.0	5643.4	6075.5	7366.3
(regional council)	(Northland)	(Northland)	(Northland)	(Gisborne)	(Gisborne)
Extremal quotient	2.31	2.30	2.27	2.06	2.10
Population weighted coefficient of variation	107.82	116.76	116.55	103.16	106.47

Table 4. Measures of prescribing of anti-depressants in regional council areas.

Regional Council	Per-Capita Government Cost of Anti-depressants					Dispensings Per 1000 People					Days Supplied Per 1000 People				
	1993	1994	1995	1996	1997	1993	1994	1995	1996	1997	1993	1994	1995	1996	1997
Auckland	$5.59	$7.39	$8.54	$10.09	$13.00	118	131	145	219	301	5773	6457	6990	7117	8629
Bay of Plenty	$8.90	$11.13	$12.00	$12.66	$15.15	121	139	150	252	360	6742	7812	8374	8638	10 467
Canterbury	$15.07	$19.17	$22.09	$24.80	$29.50	222	250	270	388	546	10 164	11 835	12 808	12 524	15 525
Gisborne	$6.06	$7.21	$5.86	$5.87	$7.09	103	110	116	170	237	6126	6676	6603	6076	7366
Hawkes Bay	$3.72	$4.76	$5.44	$6.74	$9.46	119	122	138	219	306	5616	5895	6257	6769	8357
Manawatu-Wanganui	$5.89	$8.80	$10.53	$12.20	$16.85	122	149	160	256	379	5966	7134	7865	8230	10 679
Marlborough	$5.49	$9.30	$11.36	$13.67	$18.82	163	184	210	286	429	9034	10 778	12 030	10 769	12 879
Nelson	$4.71	$7.74	$11.99	$15.25	$17.58	148	172	208	307	419	7000	8062	9562	9821	11 912
Northland	$3.40	$4.11	$5.53	$10.31	$15.71	96	100	114	219	330	4712	5142	5643	6897	9428
Otago	$8.60	$10.30	$12.67	$14.07	$18.16	182	191	207	298	429	8545	9251	9978	9692	12 250
Southland	$3.74	$4.90	$9.70	$11.30	$13.30	122	132	176	256	342	6183	6787	8540	8489	9787
Taranaki	$5.46	$6.71	$9.56	$12.65	$17.11	156	166	195	311	469	7165	7716	8970	10 037	13 460
Tasman	$3.79	$5.26	$7.19	$9.44	$12.53	112	121	134	201	294	6005	6294	6802	7075	8951
Waikato	$6.91	$9.06	$10.53	$11.58	$15.45	116	133	153	240	351	6212	7111	7858	7973	10 010
Wellington	$5.84	$7.26	$9.58	$12.26	$17.74	135	144	160	273	412	6873	7322	8079	8768	11 445
West Coast	$6.85	$9.62	$10.92	$12.16	$16.27	137	162	181	253	372	5736	7392	7906	8408	11 528

Table 5. Decomposition of regional variation in expenditure per person.

	Percentage of variance explained in year				
Variable	1993	1994	1995	1996	1997
Dispensings per person	32.0	36.1	42.9	37.3	42.7
Expenditure per dispensing	56.6	40.0	27.1	24.6	21.8
Covariance	11.4	23.9	30.0	38.1	35.5

Table 6. Decomposition of regional variation in days per person.

	Percentage of variance explained in year				
Variable	1993	1994	1995	1996	1997
Dispensings per person	123.8	117.2	109.7	106.9	110.4
Days per dispensing	20.7	15.7	12.9	7.3	3.7
Covariance	-44.5	-32.9	-22.6	-14.2	-14.1

depressants. Some regions, such as Canterbury and the Bay of Plenty, used new anti-depressants quite frequently. Elsewhere, in Southland and Taranaki, new drugs were less widely dispensed. Over the next four years, the proportion of new drugs used converged between regions. At the beginning of the period, per-capita expenditure varied mostly because of this difference in the use of new drugs. By 1997, the difference had narrowed, and per-capita expenditure now varied mostly because of variation in dispensings per-capita. In 1997, expenditure per-capita on anti-depressants varied more than four-fold. This was because doctors in some regions prescribed more and more expensive anti-depressants than doctors in other regions. These two trends exaggerated regional differences, rather than nullified them.

Although regional variation may seem substantial, it is evident (Table 4) that days supplied per 1000 people in Northland (a low use region) in 1997 were nearly as high as the days supplied in Canterbury (a high use region) in 1993, providing further evidence of regional convergence over time. It is possible that over time, the inter-regional differences will narrow further as

regions with low use of anti-depressants catch-up with regions where use is currently high.

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1. Roberts E, Norris P. Growth and change in the prescribing of anti-depressants in New Zealand, 1993-1997. NZ Med J 2001; 114: 25-7.
2. Andersen TF, Mooney G, editors. The challenges of medical practice variation. Houndmills: McMillan; 1990.
3. Paul-Shaheen P, Deane Clark J, Williams D. Small area analysis: a review and analysis of the North American literature. J Health Polit Policy Law 1987; 12: 741-809.
4. Casparie AF. The ambiguous relationship between practice variation and appropriateness of care: an agenda for further research. Health Policy 1996; 35: 247-56.
5. David PB, Yee RL, Millar J. Accounting for medical variation: the case of prescribing activity in a New Zealand general practice sample. Soc Sci Med 1994; 39: 367.
6. Norris P, Calcott P, Laugesen M. The prescribing of new antidepressants in New Zealand. New Zealand Family Physician 1998; 25: 45-9.
7. Time Space Research Pty Ltd. Supermap 3.0 (CD-ROM). Melbourne: Time Space Research Pty Ltd, 1997.
8. SAS Institute. SAS Procedures Guide, Version 6. Third ed. Cary: SAS Institute, 1990.

Non-invasive methods for measuring data quality in general practice

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Abstract

Aim. To develop non-invasive methods of measuring the quality of data recorded in general practice.

Methods. Laboratory and pharmaceutical claims data from fourteen practices (44 doctors) from the FirstHealth network of general practices were examined to determine the extent to which valid minimum bounds on expected rates of diagnosis coding could be established. These were compared with recorded rates in patient notes to measure completeness of diagnosis recording. Data completeness was measured for demographic data and a marker for the accuracy of gender coding was developed from diagnosis data.

Results. Minimum rates of diagnosis could be established for asthma, diabetes (NIDDM and IDDM), ischaemic heart disease, hypothyroidism, bipolar affective disorder and Parkinson's disease. Minimum bounds for the number of patients requiring monitoring of warfarin and digoxin levels were also established. These expected minimum rates were combined with measures of completeness of age, gender, ethnicity and smoking data, and a gender coding accuracy measure, to produce a set of fourteen data quality indicators. Pass/fail thresholds on each indicator were set and each of the fourteen practices was scored on the number of passes they achieved. The scores ranged from three to nine out of fourteen passses.

Conclusions. Non-invasive data quality measures may be useful in providing feedback to general practitioners as part of a data quality improvement cycle. The sensitivity of this method will decline as data quality improves.

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Over the past decade, the amount of information collected in general practice (GP) has increased significantly. Across New Zealand, at least 85% of GPs now use computers.[1] Most often, computers are used for accounts and the maintenance of age/sex registers,[2] but increasingly, doctors are using practice management systems for clinical notes, prescribing and laboratory test ordering, as well as practice administration, and many doctors routinely code diagnoses using Read codes. Since this information is used for an increasing range of purposes, from the claiming of subsidies to disease surveillance, the quality of the data recorded by GPs will come under increasing scrutiny. Internationally, there is widespread interest in the introduction of information technology in primary care and the NHS Executive in the UK is funding a major programme to support the collection and analysis of primary care data, led by one of the authors (MP).

In November 1998, the RNZCGP Research Unit in the Department of General Practice and Primary Health Care at the University of Auckland was contracted by FirstHealth to develop methods for measuring the quality of the data recorded by general practice. FirstHealth collects data from all practices. A Clinical Policy Committee determines the data to be collected. The data are collected automatically using Structured Query Language (SQL) 'queries'. We were supplied with data from fourteen practices (representing 44 GPs) in the PrimeHealth group of practices, in the Western Bay of Plenty. All practices used computerised clinical records, twelve using 'MedTech' and two using 'GPDat' The data collected are shown in Table 1.

Methods

Each practice dataset was examined for completeness. In the case of demographic data, it was expected that age, gender, ethnicity and smoking status data would be recorded for every patient. To assess the completeness of diagnosis codes, it was necessary to develop a method of estimating a rate of known diagnoses for each practice, and comparing recorded rates with these estimates.

Data for the same practices were downloaded from Health Benefits Limited (HBL) for all laboratory tests and prescriptions for which claims were submitted to HBL for the year April 1997 to March 1998. These data were merged on practice codes to create a set of tables that could be consulted to produce monthly totals of tests and prescriptions submitted for claims, by individual test or prescription item. Each diagnosis code in the practice dataset was considered to see if a lower limit on the number of patients with that diagnosis could be derived from the laboratory or prescribing data available. For example, to determine a minimum number of diagnoses for osteoarthritis that a practice should have recorded would require finding a pharmaceutical used exclusively for osteoarthritis, and calculating the average number of prescriptions per month issued by a practice. No such pharmaceutical exists, as the commonest medications for osteoarthritis, the non-steroidal anti-inflammatories, are used in many other conditions. However, for many conditions there is a very tight association between diagnosis and prescription; for instance, insulin is only prescribed for diabetes, and lithium is only prescribed for mania.

The accuracy of estimates for the number of patients with a given diagnosis relies upon the frequency with which a prescription is given for a given condition, and the number of possible agents that may be prescribed. For example, non-insulin dependent diabetes (NIDDM) may be managed with dietary modification only. Cases managed in this way will generate no prescriptions, and estimates of cases based on prescribing analysis will be low.